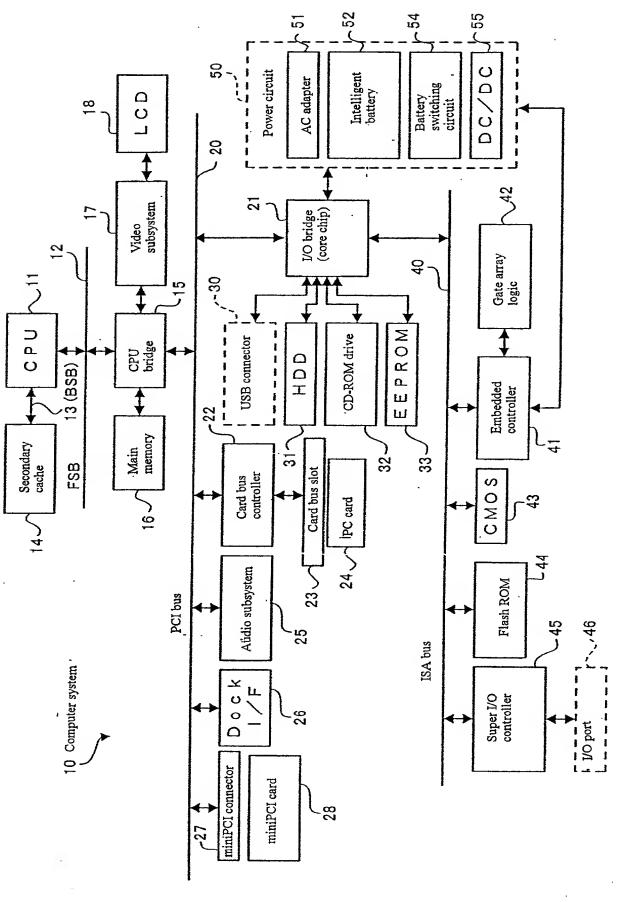
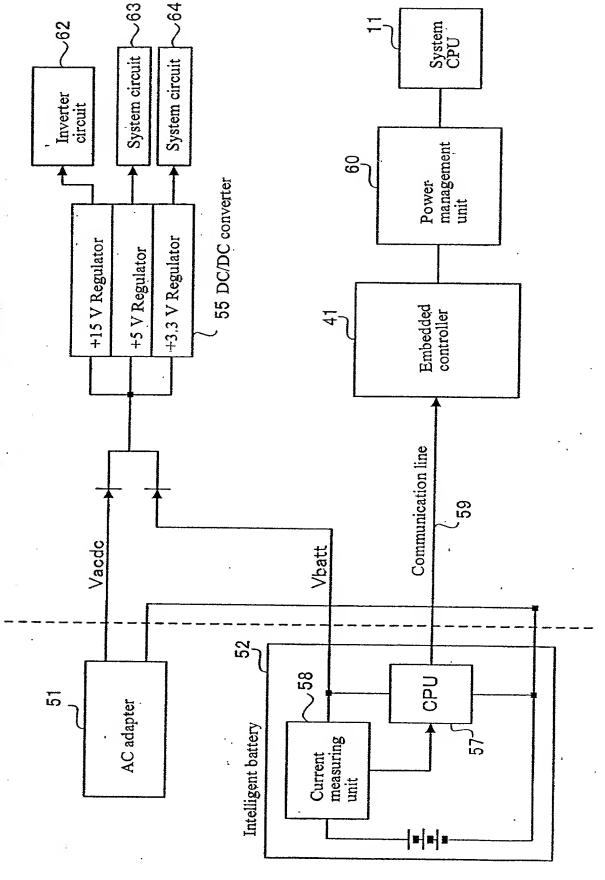
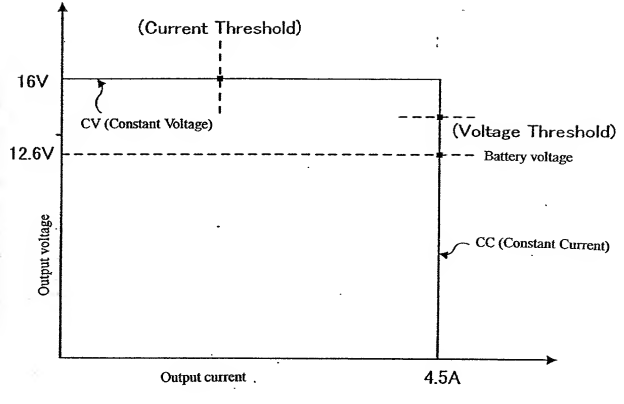
[Figure 1]


10 Computer system
CPU
11
12
FSB
13 (BSB)
Secondary cache
14
Main memory
16
CPU bridge
15
Video subsystem
17
LCD
18
20
I/O bridge (core chip)
21
Power circuit
50
AC adapter
51
Intelligent battery
52
Battery switching circuit
54
DC/DC
55
PCI bus
22
USB connector
30
HDD
31
CD-ROM drive
32
EEPROM
33
Card bus controller
Card bus slot
23
PC card
24
Audio subsystem
25
Dock I/F
26
miniPCI connector
27
miniPCI card
28
ISA bus
40
Gate array logic
42
Embedded controller
41
CMOS
43
Flash ROM
44
Super I/O controller
45
I/O port
46

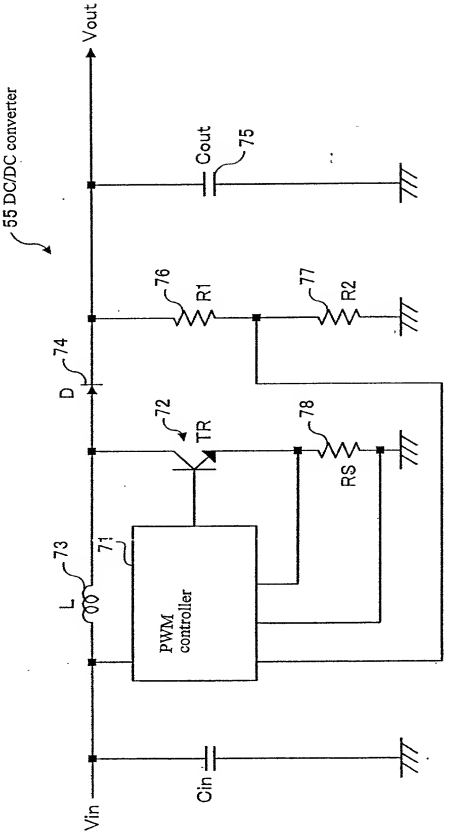
[Figure 2]


62
Inverter circuit
63
System circuit
64
System circuit
+15 V Regulator
+5 V Regulator
+3.3 V Regulator
55 DC/DC converter
11
System CPU
60
Power management unit
41
Embedded controller
Communication line
59
Vacdc
Vbatt
51
AC adapter
52
Intelligent battery
58
Current measuring unit
CPU
57

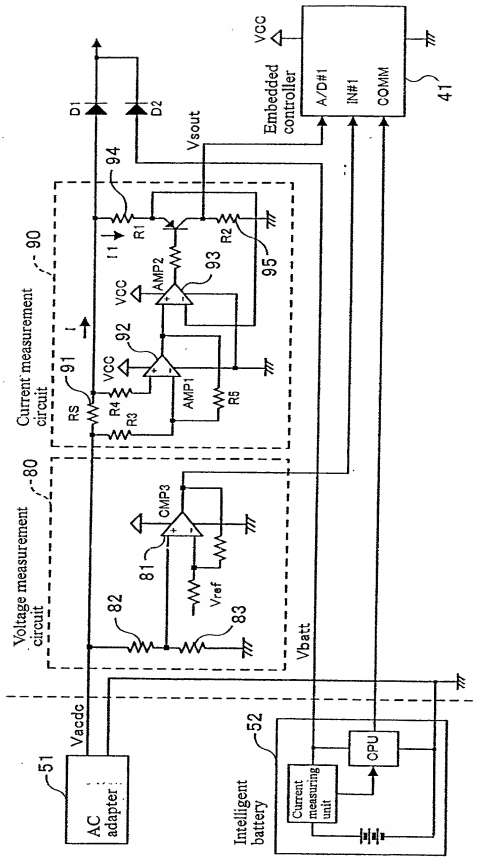
[Figure 3] (3/7)


(Current Threshold)
16V
CV (Constant Voltage)
(Voltage Threshold)
12.6V
Battery voltage
Output voltage
CC (Constant Current)
Output current
4.5A

[Figure 4]


55 DC/DC converter
Vout
Cout
75
76
R1
77
R2
74
D
72
TR
78
RS
73
L
71
PWM controller
Cin
Vin

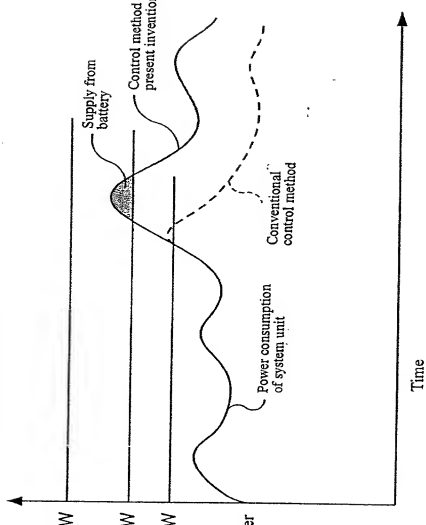
[Figure 5]


AC adapter
51
Vacdc
Intelligent battery
52
Current measuring unit
CPU
Vbatt
Voltage measurement circuit
80
82
83
81
CMP3
Vref
Current measurement circuit
90
91
92
93
94
95
RS
R3
R4
R5
R6
R1
R2
AMP1
AMP2
VCC
I
I1
D1
D2
Vsout
Embedded controller
41
A/D#1
IN#1
COMM

[Figure 6]

(a) Maximum power consumption of system
201
+3.3 V logic circuit
202
+5 V maximum power HDD/CD-ROM
203
CPU maximum power
85W
(b) Conventional maximum power control method
206
CPU maximum power
207 Margin
208
204
+3.3 V logic circuit
205
+5V HDD/CD-ROM
Real CPU power
64W
72W

[Figure 7]


Maxinum power consumption of system unit
85W
Maximum output power of power supply apparatus
P_{acdc}
72W
64W
Power
Supply from battery
Control method of present invention
Conventional control method
Power consumption of system unit
Time